Information Disclosure Statement

Applicant respectfully requests that a copy of the 1449 form, listing all references that were submitted with the Information Disclosure Statement filed on July 3, 2001, marked as being considered and initialed by the Examiner, be returned with the next official communication.

Specification

The abstract of the disclosure was objected to because it was too long. Applicant has amended the abstract as requested. Applicant respectfully requests that this objection be withdrawn.

Rejections Under 35 U.S.C. § 112

Claims 1-31 were rejected under 35 USC § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the Applicant regards as the invention.

The Office Action took the position that the term "pair of inputs to the operational amplifier" in claim 1 and other claims is used by claim 2 and other claims to mean "pair of inputs from the differential output," while the accepted meaning is "pair of inputs to the operational amplifier."

Applicant has amended claim 2 (and other claims as appropriate) to indicate that the electronic selector circuit "de-couples the amplifier input from the differential output." In other words the amplifier input is de-coupled "from the differential output." Accordingly, Applicant respectfully requests that this rejection be withdrawn.

The Office Action took the position that claim 15 was indefinite since it said "a synchronization source ..." and then said "... wherein the synchronization source is determined by ..." Applicant has amended claim 15 to remove the latter language. Accordingly, Applicant respectfully requests that this rejection be withdrawn.

The Office Action took the position that claims 1, 15, 23 and others are incomplete for omitting essential structural cooperative relationships of elements. The Office Action indicated that "the electronic selector has an (i.e. one) input that is responsive to the input signal. So, there

is an omission as to how the electronic selector is coupled to a differential output of the phase detector." Applicant has amended claims 1, 8, 15, and 23 to provide clarification on this point. Accordingly, Applicant respectfully requests that this rejection be withdrawn.

The Office Action took the position that claims 2, 7, 8, and others are incomplete for omitting essential structural cooperative relationships of elements. The Office Action indicated that these claims "recite '... pair of inputs from the differential output ... .' This indicates that there is only one output. Thus, it is not shown how a pair of inputs can be from just one output." As noted above, Applicant has amended claim 2 (and other claims as appropriate) to indicate that the electronic selector circuit "de-couples the amplifier input from the differential output." In other words the amplifier input is de-coupled "from the differential output." Accordingly, Applicant respectfully requests that this rejection be withdrawn.

The Office Action took the position that in claim 5 and others there is insufficient antecedent basis for the recitation of "a switch which couples the pair of inputs together." Applicant has amended claim 5 to recite "the pair of amplifier inputs". Antecedent basis is found in claim 4. Appropriate corresponding amendments have been made to the other claims. Accordingly, Applicant respectfully requests that this rejection be withdrawn.

The Office Action took the position that in claim 6 and others there is insufficient antecedent basis for the recitation of a "circuit which holds the pair of inputs ..." Applicant has amended claim 6 to recite "wherein the amplifier input includes a pair of amplifier inputs" and "a logic-based selector circuit which holds the pair of amplifier inputs to an identical potential level when the input signal to the phase detector is interrupted." Applicant respectfully submits that there is adequate antecedent basis for this amended language and requests that this rejection be withdrawn.

The Office Action rejected the claims as being indefinite since "the phase detector has two inputs and the operational amplifier has two inputs." Applicant has amended claims 1, 8, 15, and 23 to recite "at least one amplifier input." Appropriate corresponding amendments have been made to the other claims. Accordingly, Applicant respectfully requests that this rejection be withdrawn.

Rejections Under 35 U.S.C. § 102

Claims 1, 2, 3, 8, 9, 10, and 15 were rejected under 35 USC § 102(b) as being anticipated by Abe et al. (U.S. Patent No. 5,319,320).

Amended claim 1 of the present application is directed to a phase locked loop circuit. The phase locked loop includes a differential phase detector that receives an input signal and a feedback signal and produces a differential output signal. The phase locked loop also includes an electronic selector circuit. The electronic selector circuit has at least one first input coupled to the differential output signal of the phase detector, and a second input that is responsive to a detected state of the input signal. The phase locked loop also includes a loop filter circuit having an operational amplifier. The operational amplifier has at least one amplifier input. The electronic selector circuit provides the differential output signal of the phase detector to the amplifier input. The phase locked loop also includes a voltage controlled oscillator coupled to an output of the operational amplifier and providing an output frequency for the phased locked loop circuit. The electronic selector circuit is operable to control the amplifier input to hold the output frequency of the voltage controlled oscillator at a substantially constant frequency when the input signal to the phase detector is interrupted.

The cited reference fails to teach or disclose a phase locked loop circuit wherein the electronic selector circuit is operable to control the amplifier input to hold the output frequency of the voltage controlled oscillator at a substantially constant frequency when the input signal to the phase detector is interrupted as recited in amended claim 1 of the present application. The Office Action cites the item labeled SW1 in Abe along with items 75 and 70 (and "possible other components") to support the position that Abe teaches an electronic selector circuit as recited in claim 1 of the present application. The Office Action cites paragraphs 5 and 6 of Abe to support the position that Abe teaches an electronic selector circuit that is operable to control the input to the operational amplifier to hold the output frequency of the voltage controlled oscillator at a substantially constant frequency as recited in claim 1 of the present application.

Applicant has amended claim 1 to indicate that the electronic selector circuit is operable to control the amplifier input to hold the output frequency of the voltage controlled oscillator at a substantially constant frequency *when the input signal to the phase detector is interrupted.* The

cited portions of Abe do not teach this feature of amended claim 1. The Office Action quotes the following portion of Abe in support of this rejection:

> Since oscillation frequency f.sub.OSC of voltage-controlled oscillator 40 is varied by the value of the filter output voltage V.sub.F, the phase difference between oscillator output V.sub.OUT and input signal S.sub.IN becomes zero as time progresses.
>
> During a time in which signals X.sub.1, X.sub.2 of each period are not generated, an integrated load is stored in capacitor C.sub.F, and, therefore, the output of voltage-controlled oscillator 40 is controlled by that charging voltage. Therefore, the charging voltage of capacitor C.sub.F for current i functions as a frequency control signal for the pull-in operation that matches oscillation frequency f.sub.OSC to the frequency of input signal S.sub.IN.

Paragraphs 5 and 6 of Abe. None of the cited passages of Abe provide any teaching relating to "when the input signal to the phase detector is interrupted" as recited in amended claim 1 of the present application. Paragraph 5 makes no such reference. Moreover, that the phase difference detection signals X.sub.1 and X.sub.2 are not generated when there is no phase difference provides no teaching relating to when an input signal to a phase detector is interrupted. See, for example, Abe, first sentence of paragraph 5 ("When a phase difference occurs in oscillator output V.sub.OUT with respect to input signal S.sub.IN in a phase-locked loop having the above configuration, phase comparator 10 generates phase difference detection signals X.sub.1, X.sub.2.").

Moreover, Abe does not otherwise indicate that items SW1, 70 and 75 relate to an electronic selector circuit operable to control the amplifier input to hold the output frequency of the voltage controlled oscillator at a substantially constant frequency when the input signal to the phase detector is interrupted as recited in amended claim 1 of the present application.

Therefore, based on the foregoing arguments, it is respectfully submitted that claim 1 is not anticipated in light of the cited art and is allowable.

Amended claim 2 of the present application depends from claim 1 and further indicates that the electronic selector circuit de-couples the amplifier input from the differential output and holds the output frequency under an external command when the input signal to the phase detector is interrupted.

Claim 2 allowable for at least the reasons set forth above with respect to claim 1. Moreover, the cited reference fails to disclose an electronic selector circuit that de-couples the amplifier input from the differential output and holds the output frequency under an external command when the input signal to the phase detector is interrupted as recited in amended claim 2 of the present application. The Office Action takes the position that "if X1 and X2 are low then V1 will not change as shown in fig. 3 and thus 60, in fig. 1, is decoupled." Applicant respectfully submits that even if V1 does not change as asserted in the Office Action, that still does not teach an electronic selector circuit that "de-couples the amplifier input from the differential output" as recited in amended claim 2. Abe explicitly indicates that SW1 couples V1 to amplifier 92 *either* through R1 *or* through R2. No decoupling is taught.

The Office Action also cites paragraphs 5 and 6, FIG. 1, items b1, b2, SW2, and item 95 of Abe to support the position that Abe teaches an electronic selector circuit that holds the output frequency under an external command when the input signal to the phase detector is interrupted. As noted above, paragraphs 5 and 6 of Abe do not provide any teaching relating to when the input signal to the phase detector is interrupted. Moreover, Abe does not indicate that the "zone switching signal Z" is related to when the input signal to the phase detector is interrupted. See, for example, Abe, col. 10, lines 29-35 ("Next, when the zone of the hard disk, etc., changes and input signals S.sub.IN changes to the second data transfer rate (frequency f.sub.2), which is faster than the first data transfer rate (frequency f.sub.1), switch SW.sub.1 is connected to resistor R.sub.2 and switch SW.sub.2 is connected to bias b.sub.2, by the generation of zone switching signal Z so as to correspond to the second data transfer rate.").

Therefore, based on the foregoing arguments, it is respectfully submitted that claim 2 is not anticipated in light of the cited art and is allowable.

Claim 3 depends from claim 2 and further indicates that the electronic selector circuit holds a current signal input to the operational amplifier when a reference signal to the phase detector is interrupted.

Claim 3 depends from claims 1 and 2 and is likewise allowable for at least the reasons set forth above with respect to claims 1 and 2.

Amended claim 8 is directed to a phase locked loop circuit. The phase locked loop circuit includes a differential phase detector that receives an input signal and a feedback signal and produces a differential output signal. The phase locked loop circuit further includes an electronic selector circuit having at least one first input coupled to the differential output signal of the phase detector, and a second input that is responsive to a detected state of the input signal. The phase locked loop circuit further includes a loop filter circuit having an operational amplifier. The operational amplifier has at least one amplifier input. The electronic selector circuit provides the differential output signal of the phase detector to the amplifier input. The phase locked loop further includes a voltage controlled oscillator coupled to an output of the operational amplifier and providing an output frequency for the phased locked loop circuit. The electronic selector circuit de-couples the amplifier input from the differential output and holds the output frequency of the voltage controlled oscillator to a last received signal from the differential output when the input signal to the phase detector is interrupted.

The cited reference fails to teach an electronic selector circuit that de-couples the amplifier input from the differential output and holds the output frequency of the voltage controlled oscillator to a last received signal from the differential output when the input signal to the phase detector is interrupted as recited in amended claim 8 of the present application. The Office Action took the position that "in fig. 1 if R1 is much larger than R2 or vice versa, then this equates to decoupling both outputs of the phase detector which are narrowed to just one input into the switch." Applicant respectfully traverses this statement and reasoning. There is no teaching whatsoever in Abe that "R1 is much larger than R2 or vice versa" or as to how this "equates to decoupling both outputs of the phase detector." Moreover, this appears to be contrary to what is actually described in Abe. Abe indicates that SW1 couples V1 to amplifier 92 *either* through R1 *or* through R2. No decoupling is taught.

The Office Action also cites paragraphs 5 and 6 of Abe to support this rejection. As noted above, the paragraphs 5 and 6 of Abe do not provide any teaching relating to when the input signal to the phase detector is interrupted.

Therefore, based on the foregoing arguments, it is respectfully submitted that claim 8 is not anticipated in light of the cited art and is allowable.

Amended claim 9 depends from claim 8 and further indicates that the amplifier input includes a pair of amplifier inputs and the electronic selector circuit includes a switch which couples the pair of amplifier inputs together to hold the last received signal as a current signal input to the operational amplifier when the input signal is interrupted.

Claim 9 depends from claim 8 is allowable for at least the reasons given above with respect to claim 8.

Amended claim 10 depends from claim 8 and further indicates that the amplifier input includes a pair of amplifier inputs and the electronic selector circuit includes a logic-based selector circuit which holds the pair of amplifier inputs to an identical potential level to hold the last received signal from the differential output at the operational amplifier when the input signal to the phase detector is interrupted.

Claim 10 depends from claim 8 is allowable for at least the reasons given above with respect to claim 8.

Amended claim 15 is directed to a communication system. The system includes a number of traffic cards having traffic inputs and traffic outputs. The system further includes a switching device coupled to the number of traffic cards. The system further includes a synchronization source, coupled to the number of traffic cards, having a selector coupled to an external synchronization source and a controller. The selector provides an input signal to a phased locked loop circuit. The phase locked loop circuit is coupled to the controller. The phase locked loop circuit includes a differential phase detector that receives the input signal and a feedback signal and produces a differential output signal. The phase locked loop circuit further includes an electronic selector circuit having at least one first input coupled to the differential output signal of the phase detector, and a second input that is responsive to a detected state of the input signal. The phase locked loop circuit further includes a loop filter circuit having an operational amplifier. The operational amplifier has at least one amplifier input. The electronic selector circuit provides the differential output signal of the phase detector to the amplifier input. The phase locked loop circuit further includes a voltage controlled oscillator coupled to an output of the operational amplifier and providing an output frequency for the phased locked loop circuit. The electronic selector circuit de-couples the amplifier input from the differential output and

holds the output frequency of the voltage controlled oscillator to a last received signal from the differential output when the input signal to the phase detector is interrupted.

The Office Action takes the position that items b1 and b2 of Fig. 1 of Abe are a number of traffic cards having inputs and outputs and that item SW2 is a switching device coupled to the number of traffic cards. Applicant respectfully submits that there is no teaching or suggestion in Abe that items b1 and b2 are traffic cards or that item SW2 is coupled to a number traffic cards. See, for example, Abe col. 6, lines 33-35 ("Phase-locked loop 100 also has a switch SW.sub.2 for switching gate voltage, by selecting differing bias voltages b.sub.1, b.sub.2 based on zone switching signal Z."). Abe is completely silent as to traffic cards.

Moreover, the Office Action fails to explain how Abe teaches a controller as recited in amended claim 15. Abe provides no such teaching and is completely silent as to a controller. As to the phase locked loop circuit, please see the above comments made with respect to claim 8.

Therefore, based on the foregoing arguments, it is respectfully submitted that claim 15 is not anticipated in light of the cited art and is allowable.

CONCLUSION

Applicant respectfully submits that the claims 1-31 are in condition for allowance and notification to that effect is earnestly requested. If necessary, please charge any additional fees or credit overpayments to Deposit Account No. 502432.

If the Examiner has any questions or concerns regarding this application, please contact the undersigned at (612) 332-4720.

Respectfully submitted,

Date: 2/18/2003

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MARKED UP VERSION OF AMENDMENTS

IN THE ABSTRACT

Improved phase locked loops are described which handle momentary breaks in an input communication channel. The phase locked loops provide the capability to "hold" the output clock in a communication system at or very near the last output frequency before the loss of input data. [The] Such phase locked loops [according to the teachings of the present invention] include a differential phase detector that receives an input signal and a feedback signal and produces a differential output signal. An electronic selector circuit is coupled to a differential output of the phase detector with an input that is responsive to a detected state of the input signal. An operational amplifier based loop filter circuit is provided in the phased locked loop. The electronic selector circuit provides the differential output of the phase detector at a pair of inputs to the operational amplifier. A voltage controlled oscillator is coupled to an output of the operational amplifier and provides an output frequency for the phased locked loop circuit. The electronic selector circuit is operable to control the input to the operational amplifier to hold an output frequency of the voltage controlled oscillator at a substantially constant frequency. [In one embodiment of the present invention, the electronic selector circuit includes a switch which couples the pair of inputs together when a reference signal, or input signal to the phase detector is interrupted. In another embodiment of the present invention, the electronic selector circuit includes a logic-based selector circuit which holds the pair of inputs to an identical potential level when the input signal to the phase detector is interrupted. Systems and methods are further included within the scope of the present invention.]

IN THE CLAIMS

1. (Amended) A phase locked loop circuit, comprising:

a differential phase detector that receives an input signal and a feedback signal and produces a differential output signal;

an electronic selector circuit having:

at least one first input coupled to the differential output signal of the phase detector; and [with an]

a second input that is responsive to a detected state of the input signal;

a loop filter circuit having an operational amplifier, the operational amplifier [based loop filter circuit,] having at least one amplifier input, wherein the electronic selector circuit provides the differential output signal of the phase detector [at a pair of inputs] to the [operational] amplifier input;

a voltage controlled oscillator coupled to an output of the operational amplifier and providing an output frequency for the phased locked loop circuit; and

wherein the electronic selector circuit is operable to control the [input to the operational] amplifier input to hold the output frequency of the voltage controlled oscillator at a substantially constant frequency when the input signal to the phase detector is interrupted.

2. (Amended) The circuit of claim 1, wherein the electronic selector circuit de-couples the [pair of inputs] amplifier input from the differential output and holds the output frequency under an external command when the input signal to the phase detector is interrupted.

4. (Amended) The circuit of claim 3, wherein the amplifier input includes a pair of amplifier inputs and wherein the electronic selector circuit holds a current signal input to the operational amplifier by coupling the pair of amplifier inputs at the same potential.

5. (Amended) The circuit of claim 4, wherein the electronic selector circuit includes a switch which couples the pair of amplifier inputs together when the reference signal to the phase detector is interrupted.

6. (Amended) The circuit of claim 2, wherein the amplifier input includes a pair of amplifier inputs and wherein the electronic selector circuit includes a logic-based selector circuit which holds the pair of amplifier inputs to an identical potential level when the input signal to the phase detector is interrupted.

7. (Amended) The circuit of claim 2, wherein the electronic selector circuit re-couples the [pair of inputs] amplifier input to the differential output of the phase detector when the input signal is restored.

8. (Amended) A phase locked loop circuit, comprising:

a differential phase detector that receives an input signal and a feedback signal and produces a differential output signal;

an electronic selector circuit having:

at least one first input coupled to the differential output signal of the phase detector; and [with an]

a second input that is responsive to a detected state of the input signal;

a loop filter circuit having an operational amplifier, the operational amplifier [based loop filter circuit,] having at least one amplifier input, wherein the electronic selector circuit provides the differential output signal of the phase detector [at a pair of inputs] to the [operational] amplifier input;

a voltage controlled oscillator coupled to an output of the operational amplifier and providing an output frequency for the phased locked loop circuit; and

wherein the electronic selector circuit de-couples the [pair of inputs] amplifier input from the differential output and holds the output frequency of the voltage controlled oscillator to a last received signal from the differential output when the input signal to the phase detector is interrupted.

9. (Amended) The circuit of claim 8, wherein the amplifier input includes a pair of amplifier inputs and wherein the electronic selector circuit includes a switch which couples the pair of amplifier inputs together to hold the last received signal as a current signal input to the operational amplifier when the input signal is interrupted.

10. (Amended) The circuit of claim 8, wherein the amplifier input includes a pair of amplifier inputs and wherein the electronic selector circuit includes a logic-based selector circuit which holds the pair of amplifier inputs to an identical potential level to hold the last received signal from the differential output at the operational amplifier when the input signal to the phase detector is interrupted.

11. (Amended) The circuit of claim 10, wherein the logic based selector circuit includes a pair of AND gates, each AND gate having an output coupled to one of the pair of amplifier inputs, wherein one input of each AND gate is coupled to the differential output, and wherein the other input of each AND gate is coupled to an external command signal source.

13. (Amended) The circuit of claim 8, wherein the electronic selector circuit re-couples the [pair of inputs] amplifier input to the differential output of the phase detector when the input signal to the phase detector is restored.

15. (Amended) A communication system, comprising:

a number of traffic cards having traffic inputs and traffic outputs;

a switching device coupled to the number of traffic cards; and

a synchronization source, coupled to the number of traffic cards, [wherein the synchronization source is determined by] having a selector coupled to an external synchronization source and a controller, wherein the selector provides an input signal to a phased locked loop circuit, wherein the phase locked loop circuit is coupled to the controller, and wherein the phase locked loop circuit includes:

a differential phase detector that receives the input signal and a feedback signal and produces a differential output signal;

an electronic selector circuit having:

at least one first input coupled to [a] the differential output signal of the phase detector; and [with an]

a second input that is responsive to a detected state of the input signal;

a loop filter circuit having an operational amplifier, the operational amplifier [based loop filter circuit,] having at least one amplifier input, wherein the electronic selector circuit provides the differential output signal of the phase detector [at a pair of inputs] to the [operational] amplifier input;

a voltage controlled oscillator coupled to an output of the operational amplifier and providing an output frequency for the phased locked loop circuit; and

wherein the electronic selector circuit de-couples the [pair of inputs] amplifier input from the differential output and holds the output frequency of the voltage controlled oscillator to a last received signal from the differential output when the input signal to the phase detector is interrupted.

16. (Amended) The system of claim 15, wherein the amplifier input includes a pair of amplifier inputs and wherein the electronic selector circuit includes a switch which couples the pair of [input signals] amplifier inputs together to hold the last received signal as a current signal input to the operational amplifier under an instruction from the controller when the input signal is interrupted.

17. (Amended) The system of claim 15, wherein the amplifier input includes a pair of amplifier inputs and wherein the electronic selector circuit includes a logic-based selector circuit which holds the pair of amplifier inputs to an identical potential level, under an instruction from the controller, to hold the last received signal from the differential output at the operational amplifier when the input signal to the phase detector is interrupted.

18. (Amended) The system of claim 17, wherein the logic based selector circuit includes a pair of AND gates, each AND gate having an output coupled to one of the pair of amplifier inputs, wherein one input of each AND gate is coupled to the differential output, and wherein the other input of each AND gate is coupled to an external command signal from the controller.

20. (Amended) The system of claim 15, wherein the electronic selector circuit re-couples the [pair of inputs] amplifier input to the differential output of the phase detector when the input signal is restored.

23. (Amended) A method for preventing data errors in a communication system, comprising:
coupling input data to a phase locked loop circuit, wherein the phase locked loop includes:

a differential phase detector that receives an input signal and a feedback signal and produces a differential output signal;

an electronic selector circuit having:

at least one first input coupled to [a] the differential output signal of the phase detector; and [with an]

a second input that is responsive to a detected state of the input signal;

a loop filter circuit having an operational amplifier, the operational amplifier [based loop filter circuit,] having at least one amplifier input, wherein the electronic selector circuit provides the differential output signal of the phase detector
[at a pair of inputs] to the [operational] amplifier input; and

a voltage controlled oscillator coupled to an output of the operational amplifier and providing an output frequency for the phased locked loop circuit;
using the electronic selector circuit [is operable] to control the amplifier input to [the operational amplifier] to hold the output frequency of the voltage controlled oscillator at a substantially constant frequency when the input signal to the phase detector is interrupted; and
using the electronic selector circuit to release control of the [input to the operational] amplifier input to follow the differential output when the input signal to the phase detector is restored.

24. (Amended) The method of claim 23, wherein the amplifier input includes a pair of amplifier inputs and wherein using the electronic selector circuit to hold the output frequency of the voltage controlled oscillator at a substantially constant frequency includes using the electronic selector circuit to de-couple the pair of amplifier inputs from the differential output

and hold the output frequency of the voltage controlled oscillator to a last received signal from the differential output when the input signal to the phase detector is interrupted.

25. (Amended) The method of claim 24, wherein using the electronic selector circuit to de-couple the pair of amplifier inputs from the differential output includes using a switch to couple the pair of amplifier input [signals] together to hold the last received signal as a current signal input to the operational amplifier when the input signal is interrupted.

26. (Amended) The method of claim 24, wherein using the electronic selector circuit to de-couple the pair of amplifier inputs from the differential output includes using a logic-based selector circuit to hold the pair of amplifier inputs to an identical potential level in order to hold the last received signal from the differential output at the operational amplifier when the input signal to the phase detector is interrupted.

27. (Amended) The method of claim 26, wherein using a logic-based selector circuit to hold the pair of amplifier inputs to an identical potential level includes using a logic-based selector circuit having a pair of AND gates, coupling an output of each AND gate to one of the pair of amplifier inputs, coupling one input of each AND gate to the differential output, and coupling the other input of each AND gate to an external command signal source.

29. (Amended) The method of claim 23, wherein the amplifier input includes a pair of amplifier inputs and wherein using the electronic selector circuit to release control of the [input to the operational] amplifier input to follow the differential output includes using the electronic selector circuit to re-couple the pair of amplifier inputs to the differential output of the phase detector when the input signal is restored.